

Title: Fractional Dough

Link to Outcomes:

- **Problem Solving** Students will apply various strategies to solve problems with open-ended answers. Students will also work in a cooperative atmosphere when verifying and interpreting results of the original activity.
- **Communication** Students will communicate mathematically. They will read, write, speak, and represent math concepts using the signs, symbols, and terms of the discipline.
- **Reasoning** Students will reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will relate the mathematics used in real-life situations such as manipulating fractions in recipes and using graphs to analyze data.
- **Number Sense** Students will describe and apply number relationships using concrete and abstract materials.
- **Computation** Students will solve problems using arithmetic operations.
- **Measurement** Students will apply concepts of measurement using standard units. They will apply measurement skills to real-world problem-solving situations.
- **Statistics** Students will collect, organize, and display data and will interpret information obtained from displays.
- **Fractions** Students will relate fractional concepts to real-world situations.

Brief Overview:

This lesson engages students in a hands-on activity while building on prior math skills. It is a way of motivating students to be involved in math in a non-threatening environment. Students will manipulate fractions while making three different types of dough. They will collect, analyze, and interpret data to determine the preferred type of dough. They will also discover the use of fractions within their collected data.

Grade/Level:

Grades 4-5

Duration/Length:

This activity should take 4 days.

Prerequisite Knowledge:

Students should have prior knowledge of the following skills:

- identifying fractional parts.
- measuring by use of standard units for capacity.
- constructing charts for data collection.
- constructing, interpreting, and analyzing graphs.
- writing a business letter.

Objectives:

The students will:

- use the appropriate unit of measurement for capacity.
- convert mixed numbers to improper fractions.
- identify fractions.
- generate criteria for evaluating characteristics of dough.
- create a survey.
- collect and organize data.
- read and interpret data.
- write and present an analysis of their data.

Materials/Resources/Printed Materials:

- Student Resources #1 - #4
- Ingredients — See Student Resources #2 - #4
- Mixing tools — See Student Resources #2 - #4
- Glass measuring cup with water
- Chart paper
- Markers, pencils, crayons
- Sealed plastic bags
- Paper towels

Development/Procedures:**Day 1 “Making the Dough”**

- Students will convert mixed numbers to improper fractions while using appropriate units of measurement.
- Ask students about their use of fractions outside the classroom. Create a web of their responses, then ask students questions about the use of fractions in cooking.

How many of you have made cookies?

What tools do you use to measure the ingredients?

What are the different sizes of measuring cups?

- Tell students that they will be making dough but will be limited to using either a $\frac{1}{3}$ or a $\frac{1}{4}$ measuring cup. Ask students how they would measure $1\frac{1}{2}$ cups of flour using only a $\frac{1}{4}$ measuring cup. How many $\frac{1}{4}$ measuring cups do you think are needed to be equivalent? (Record predictions) Model by pouring water from a $\frac{1}{4}$ measuring cup into a glass measuring cup until $1\frac{1}{2}$ cups are reached. Students compare predictions with actual result.
- Three types of dough will be made (see Student Resources #2, #3, and #4). Place the students in groups with each group making one type of dough. Students are to find improper fractions that are equivalent to the whole and mixed numbers in the recipes, based on the measuring tools given. Students record fractions in the space provided on recipe worksheets (Student Resources #2, #3, and #4) in their packets. Finished dough will be stored in plastic bags.
- After groups have made their dough, students will meet as a class and discuss how they determined their fraction conversions.

Day 2 “Dough Characteristics”

- Students will generate criteria for evaluating characteristics of dough and will create questions for a survey.
- Ask the students several questions regarding the types of dough produced.

What are some of the qualities found in your dough?

Which qualities are most important to you?

What are some of the differences between the types of dough?

- Explain to the students that the primary grades are interested in saving money by using homemade dough. They have asked that this class research and recommend the best type of dough. The class will choose the three most important dough characteristics that will be used for judging the dough produced the day before. These criteria will be used to develop three survey questions that will be asked to children in the primary grades (example: Which dough has the best texture? color? consistency?). Students will record survey questions in their packets (see Student Resource #5).

Day 3 “Collecting Dough Data”

- Student groups will visit primary classes with samples of each type of dough. Children will play with each type of dough, and students will ask the survey questions. Students will organize responses on corresponding frequency charts (Student Resource #5).
- Groups will return to class and will represent their data in three bar graphs contained (one for each survey question) in the student packet (Student Resource #6). Each member of the group will be responsible for recording the graphs, writing fractional representations for each bar, and answering the analytical questions (Student Resource #7).

- Data from each group will be compiled to determine the overall results gathered from the primary classes. The class will interpret the results of the entire survey and will compare it with the group surveys. The class will use the data to decide which dough should be recommended for use by the primary grades.
- Class will discuss how the survey assisted them in determining which dough was preferred by students in the primary grades. It will also discuss the role fractions can play in analyzing data.

Day 4 “Dough Persuasion”

- Students will refer to individual and class graphs while responding to a writing prompt asking them to write a letter of persuasion (Student Resource #8).

Evaluation:

Teacher will evaluate students on a completed student packet comprised of recipes with fraction conversions, survey results (including frequency charts), bar graphs, and written analysis of questions. Students will also be required to explain their findings in their responses to the writing prompt.

Extension/Follow Up:

- Questions for further investigations

Would the results be different if the survey were given to younger/older children?
How would the results change? Why would they change?

How would the dough change if the ingredients were not properly measured?

When would you have another occasion to change mixed numbers to improper fractions or the reverse.

- Design containers and labels that would be used if the dough were marketed.
- Calculate cost of making the dough for the primary grades.
- Calculate the percentage of each ingredient in the dough.

Authors:

Jennifer McCullum
Riviera Beach E.S.
Anne Arundel County

Angela Zehner
Van Bokkelen E.S.
Anne Arundel County

Fractional Dough Student Packet

Name _____

Cornstarch Clay

Directions: Use the following recipe to make the dough. Remember that you have been given only a $\frac{1}{3}$ measuring cup with which to work. Where indicated with an *, record the improper fraction that was used to add an equivalent amount of the necessary ingredient.

Ingredients:

* _____	2- $\frac{1}{3}$ cups cornstarch
	$\frac{2}{3}$ cup vegetable oil
* _____	2 cups flour
	food coloring

Combine cornstarch and oil in a bowl. Stir well until syrupy. Add flour gradually until thick and doughy. Add drops of food coloring, if desired. Knead. Store in an airtight container.

*Adapted from Ready-to-Use Activities for Before and After School Programs, The Center for Applied Research in Education, 1989.

Playdough

Directions: Use the following recipe to make the dough. Remember that you have been given only a $\frac{1}{4}$ measuring cup with which to work. Where indicated with an *, record the improper fraction that was used to add an equivalent amount of the necessary ingredient.

Ingredients:

* _____	3- $\frac{1}{2}$ cups flour
* _____	$\frac{1}{2}$ cup salt
	1 tbsp. cream of tartar
* _____	1- $\frac{1}{2}$ cups boiling water
	2 tbsp. vegetable oil
	food coloring

Mix flour and salt in a bowl. In another bowl, mix cream of tartar, water, oil, and food coloring. Combine the mixtures. Knead, adding extra flour if sticky. Keep in an airtight container.

*Adapted from Ready -to-Use Activities for Before and After School Programs, The Center for Applied Research in Education, 1989.

Salt Dough

Directions: Use the following recipe to make the dough. Remember that you have been given only a $\frac{1}{4}$ measuring cup with which to work. Where indicated with an *, record the improper fraction that was used to add an equivalent amount of the necessary ingredient.

Ingredients:

- * _____ 4- $\frac{1}{2}$ cups flour
- * _____ 1 cup salt
- * _____ 1- $\frac{1}{2}$ cups warm water
- _____ food coloring

Mix flour and salt in a bowl. Slowly add warm water. Use your hands to mix all together. Add drops of food coloring, if desired. Knead on a flour-covered surface for about 10 minutes. Wrap finished dough tightly or place in a covered container.

*Adapted from Kids Create! by Laurie Carlson, Williamson Publishing, 1990

Dough Survey

Q. _____

Frequency Chart		
Type of Dough	Tally	Total
Cornstarch	_____	_____
Salt Dough	_____	_____
Playdough	_____	_____

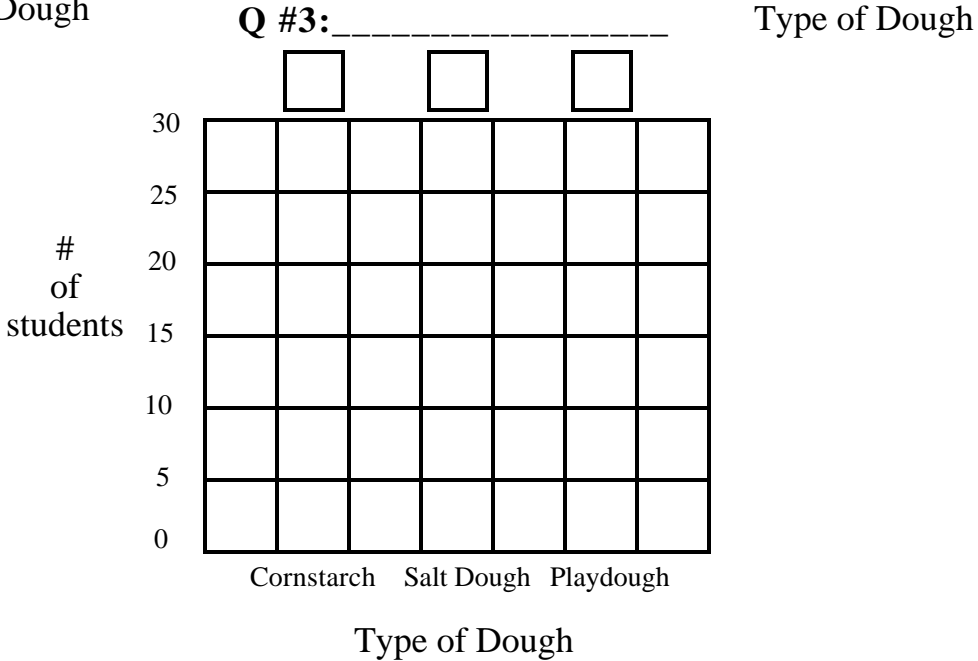
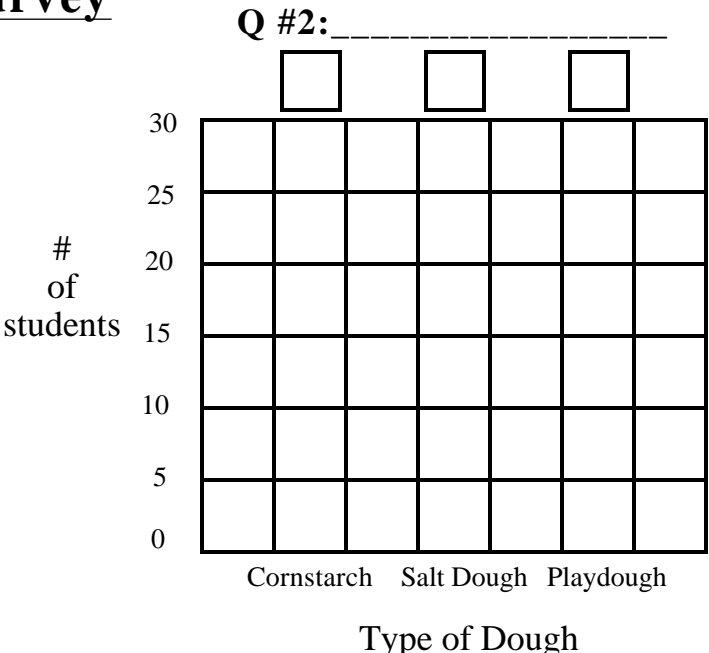
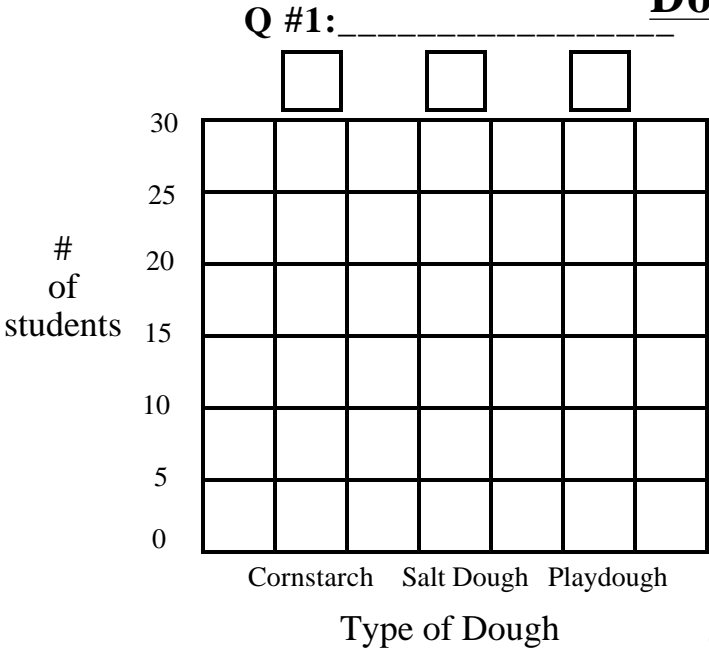
Q. _____

Frequency Chart		
Type of Dough	Tally	Total
Cornstarch	_____	_____
Salt Dough	_____	_____
Playdough	_____	_____

Q. _____

Frequency Chart		
Type of Dough	Tally	Total
Cornstarch	_____	_____
Salt Dough	_____	_____
Playdough	_____	_____

Dough Survey



In each box above the graphs, record the fraction represented by the bar below.

ANALYSIS QUESTIONS

1. How many people did you survey? _____
2. Which dough was liked best? _____
3. Which dough was liked least? _____
4. What are the physical differences between the dough that was liked best and liked least? _____

5. Name the fraction of the students who liked the most popular dough.

6. Name the fraction of the students who liked the least popular dough.

7. Based on your data, which type of dough should the primary grades use?

Explain your answer.

WRITING PROMPT

Recently we took a survey to determine which type of dough the primary grades should make. Think about the results of our survey. Write a letter to persuade the primary teacher to make the playdough we found to be most popular.

Before you begin to write, think about how we determined which dough was most popular. You may want to use a sequence chart to recall the steps we took to gather and analyze our information. Be sure to use proper business letter form.

Now, write a letter to persuade the primary teachers to use your dough suggestions.